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# मानक

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IS 11036 (1984): Graphite stopper heads [MTD 15: Refractories]



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*Indian Standard*

SPECIFICATION FOR  
CLAY GRAPHITE STOPPER HEADS

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INDIAN STANDARDS INSTITUTION  
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG  
NEW DELHI 110002

# *Indian Standard*

## SPECIFICATION FOR CLAY GRAPHITE STOPPER HEADS

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( Continued on page 2 )

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( Continued from page 1 )

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# *Indian Standard*

## SPECIFICATION FOR CLAY GRAPHITE STOPPER HEADS

### 0. FOREWORD

**0.1** This Indian Standard was adopted by the Indian Standards Institution on 6 August 1984, after the draft finalized by the Refractories Sectional Committee had been approved by the Structural and Metals Division Council.

**0.2** This standard has been prepared to meet the requirements of clay graphite stopper head used in steel teeming laddles.

**0.3** This standard keeps in view the manufacturing and trade practices followed in the country in this field.

**0.4** For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960\*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

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### 1. SCOPE

**1.1** This standard covers requirements for two types of graphite stopper heads for use in steel teeming laddles.

### 2. SUPPLY OF MATERIAL

**2.1** General requirements relating to the supply of graphite stopper head shall be as laid down in IS : 1387-1967†.

### 3. FREEDOM FROM DEFECTS

**3.1** The stopper head shall be compact, of homogeneous texture and free from cracks, voids and other flaws. The surface on the working face shall be smooth without protruding and crumbling grains. The working passage shall be free from sand or grog powder and other impurities.

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\* Rules for rounding off numerical values ( *revised* ).

† General requirements for the supply of metallurgical materials ( *first revision* ).

**3.2** Fractured surface of the products shall have a homogeneous texture, and the grain shall not crumble out.

**3.3** The stopper head shall also satisfy the following:

- |   |             |
|---|-------------|
| a) Breakages on surface facing nozzle and sleeves | Not allowed |
| b) Burning out of graphite on the plugs           | Not allowed |
| c) Clinker formation                              | Not allowed |
| d) Visual hair crack on the surface               | Not allowed |

## **4. DIMENSIONS AND TOLERANCES**

**4.1** The various dimensions of stopper head shall be as agreed to between the manufacturer and consumer.

**4.2** The maximum variations from specified dimensions to be allowed shall be as given in Table 1.

**TABLE 1 TOLERANCES ON DIMENSION**

SL No.	DIMENSION	TOLERANCE
i)	In diameter of products with a diameter:	
	Up to 50 mm	$\pm 1$ mm
	Over 50 and up to 100 mm	$\pm 2$ mm
	Over 100 mm	$\pm 2$ percent
ii)	In diameter of collars and grooves	$\pm 1$ mm
iii)	In height of collars or grooves	$\pm 1$ mm
iv)	In height of full stopper, including collars	$\pm 3$ percent
v)	Diameters of the plug thread	$\pm 1$ mm

## **5. SHAPE**

**5.1** In addition to the tests mentioned in Table 2, the correctness of the shape of stopper head shall be determined by the tightness of its fitting to a compatible nozzle. The contour of the dummy nozzle should be perfect. When rotating the stopper head around the axis of symmetry, no gap shall be allowed.

## **6. CHEMICAL COMPOSITION**

**6.1** The loss on ignition, indicating the carbon content in graphite stopper head, shall be not less than 15 percent for type 1 and not less than 20 percent for type 2 when determined in accordance with IS : 1527-1972\*.

\*Methods for chemical analysis of high silica refractory materials (first revision).



## 7. PHYSICAL TEST REQUIREMENTS

7.1 The stopper heads shall conform to the requirements given in Table 2.

TABLE 2 PHYSICAL REQUIREMENTS

SL No.	CHARACTERISTICS	REQUIREMENT	METHOD OF TEST ( REF TO )
(1)	(2)	(3)	(4)
i)	Pyrometric cone equivalent ( PCE ) or softening point, <i>Min</i>	1 665°C	IS : 1528 ( Part 1 )-1980*
ii)	Cold crushing strength, kg/cm <sup>2</sup> , <i>Min</i>	( see Note )	IS : 1528 ( Part 4 )-1974*
iii)	Apparent porosity, percent, <i>Max</i>	25	IS : 1528 ( Part 8 )-1974*
iv)	Bulk density, g/cm <sup>3</sup> , <i>Min</i>	1.90	IS : 1528 ( Part 12 )-1974*

NOTE — The value of cold crushing strength shall be as agreed to between the purchaser and the manufacturer.

\*Methods of sampling and physical tests for refractory materials:

Part 1 Determination of pyrometric cone equivalents (PCE) or softening point ( *second revision* ).

Part 4 Determination of cold crushing strength ( *first revision* ).

Part 8 Determination of apparent porosity ( *first revision* ).

Part 12 Determination of bulk density ( *first revision* ).

7.2 **Spalling Resistance** — When tested in accordance with IS : 1528 ( Part 3 )-1974\* at 800°C, the spherical part of the stopper head shall not be split off after one cycle.

## 8. SAMPLING

8.1 A lot of stopper heads shall comprise of not more than 1 000 numbers.

8.2 For inspection and testing 10 samples shall be taken from each lot.

8.3 Number of samples to be taken from each lot to be inspected and tested shall be as specified in Table 3.

\*Methods of sampling and physical tests for refractory material: Parts 3 Determination of spalling resistance ( *first revision* ).

TABLE 3 SCHEME FOR SAMPLING

( Clause 8.3 )

SL No.	CHARACTERISTICS	NO. OF STOPPER HEADS TAKEN FROM A LOT	REMARKS
i)	Appearance and dimensions	10	From each lot
ii)	Fractured surface	3	do
iii)	Chemical composition	An average sample shall be taken from the 3 specimens tested for fractured surface	From every third lot
iv)	Pyrometric cone equivalent ( PCE )	do	From each lot
v)	Apparent porosity	3	do
vi)	Cold crushing strength	3	do
vii)	Resistance to thermal spalling	3	do

## 9. MARKING

**9.1** Graphite stopper heads shall be clearly marked with the manufacturer's name or trade-mark, and lot number.

**9.1.1** The Graphite stopper heads may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution ( Certification Marks ) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors may be obtained from the Indian Standards Institution.